4-29-2021

Can altering the gut microbiome via diet treat symptoms of major depressive disorder?

Julia DeGrooth

CAN ALTERING THE GUT MICROBIOME VIA DIET TREAT SYMPTOMS OF MAJOR DEPRESSIVE DISORDER?

JULIA DEGROOTH
DEPARTMENT OF PSYCHOLOGY, PROVIDENCE COLLEGE

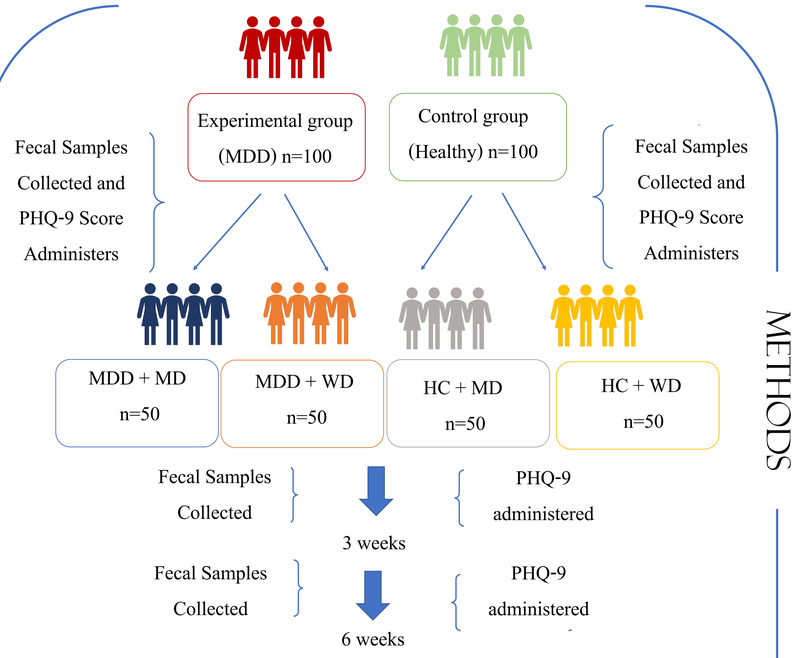
BACKGROUND

Problem: Worldwide, 350 million people suffer from Major Depressive Disorder (MDD), yet antidepressant medications do not work for 30 - 40 % of MDD patients.

Objective: Identify alternative ways to treat MDD using the gut-microbiome and Mediterranean diet (MD) and Western diet (WD). Based on previous research, if a bidirectional relationship exists between depression and the gut-microbiome, the abundance of gut bacteria will increase for Bacteroidetes, but decrease Firmicutes and Lactobacillus upon eating the MD or WD (Jiang et al., 2019).

Based on the gut-brain axis, I expect to see a more diverse microbiome when eating a Mediterranean diet than a Western diet as it improves symptoms of MDD as measured in the PHQ-9 scale.

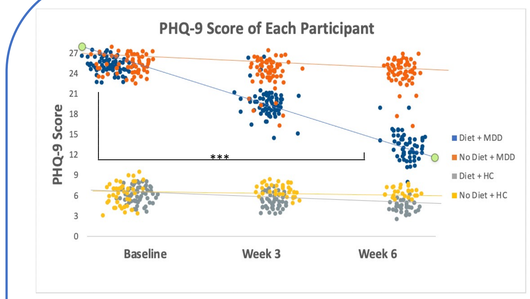
METHODS

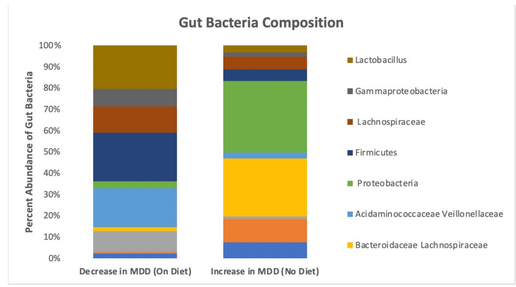


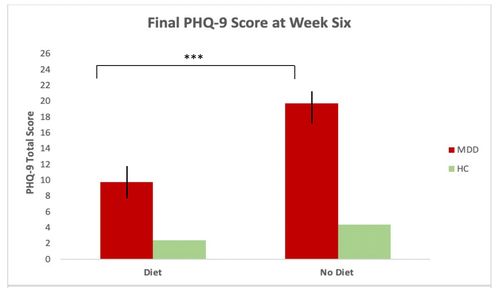
Fecal Samples- test using PCR to measure pH of the stool culture to identify the participants bacteria composition.

PHQ-9 Score- 9-item scale to measure presence and severity of MDD and used as an operational definition for all participants.

INFLUENCE OF GUT DIVERSITY AND DIET ON BEHAVIOR







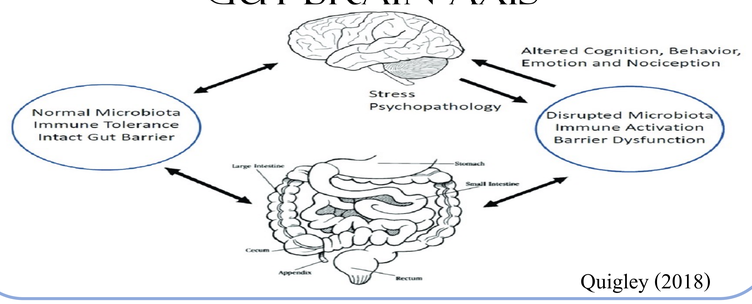
MDD patients on a Mediterranean diet showed significant decline of depression improvements to the severity of their depression compared to the control group.

Bacteroidetes
Proteobacteria
Firmicutes
Lactobacillus

Mediterranean Diet > Western Diet

Diet alters the gut microbiome via the brain-gut axis and improves behavior compared to the healthy and non- diet control groups.

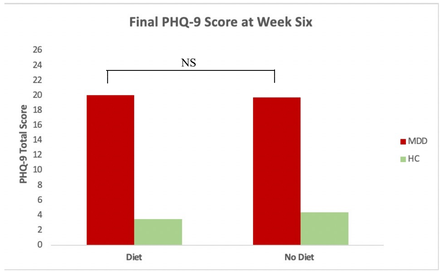
GUT-BRAIN AXIS



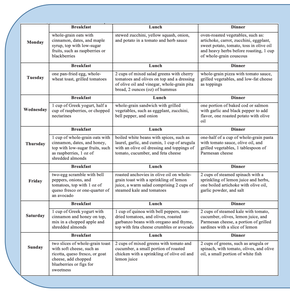
Quigley (2018)

NULL HYPOTHESIS

No change was identified between the experimental (MDD and MD) and the Control group (HC and WD)

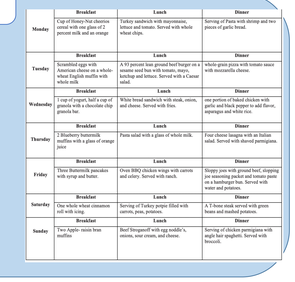


HOW MEDITERRANEAN & WESTERN DIET AFFECTS THE BRAIN



	Breakfast	Lunch	Dinner
Monday	whole-grain oats with cinnamon, dates, and maple syrup, 1 oz of dried fruits, such as raspberries or blackberries	stewed zucchini, yellow squash, onion, and potato in a tomato and herb sauce	oven-roasted vegetables, such as: artichoke, carrot, zucchini, eggplant, onion, and potato with garlic, olive oil, and heavy herbs before roasting, 1 cup of whole-grain couscous
Tuesday	one pan-fried egg, whole-wheat toast, grilled tomatoes	2 cups of mixed salad greens with cherry tomatoes and olives on top and a dressing of olive oil and vinegar, whole-grain pita bread, 2 ounces (oz) of hummus	Dinner: whole-grain pizza with tomato sauce, grilled vegetables, and low-fat cheese as toppings
Wednesday	1 cup of Greek yogurt, half a cup of raspberries, or chopped nectarines	Lunch: whole-grain sandwich with grilled vegetables, such as eggplant, zucchini, bell pepper, and onion	Dinner: one portion of baked cod or salmon with garlic and black pepper to add flavor, one roasted potato with olive oil
Thursday	2 cups of whole-grain oats with cinnamon, dates, and honey, top with low-sugar fruits, such as raspberries, 1 oz of shredded almonds	Lunch: boiled white beans with spices, such as laurel, garlic, and cumin, 1 cup of arugula with an olive oil dressing and toppings of tomato, cucumber, and feta cheese	Dinner: one half of a cup of whole-grain pasta with tomato sauce, olive oil, and grilled vegetables, 1 tablespoon of Parmesan cheese
Friday	Breakfast: two-egg scramble with bell pepper, onion, spinach, and tomatoes, top with 1 oz of queso fresco or one-quarter of an avocado	Lunch: roasted anchovies in olive oil on whole-grain toast with a side salad of tomato, onion, and a warm salad comprising 2 cups of steamed kale and tomatoes	Dinner: 2 cups of steamed spinach with a sprinkling of olive oil and herbs, one boiled artichoke with olive oil, garlic powder, and salt
Saturday	Breakfast: 1 cup of Greek yogurt with cinnamon and honey on top, mix in a chopped apple and shredded coconut	Lunch: 1 cup of quinoa with bell peppers, sun-dried tomatoes, and olives, roasted garbanzo beans with oregano and thyme, top with feta cheese, tomatoes or avocado	Dinner: 2 cups of steamed kale with tomato, cucumber, olives, lemon juice, and Parmesan cheese, a portion of grilled sardines with olive oil and lemon
Sunday	Breakfast: two slices of whole-grain toast with soft cheese, such as ricotta, queso fresco, or goat cheese, add chopped blueberries or figs for sweetness	Lunch: 2 cups of mixed greens with tomato and cucumber, a small portion of roasted chicken with a sprinkling of olive oil and lemon juice	Dinner: 2 cups of greens, such as arugula or spinach, with tomato, olives, and olive oil, a small portion of white fish

Previous studies indicate that diet influences the gut microbiome as a bidirectional relationship exists between the gut and brain because it regulates the HPA-axis, inflammation, produces and controls neurotransmitters, like GABA and short-chain fatty acids, and influence the immune system and gut barrier



	Breakfast	Lunch	Dinner
Monday	Cup of Honey-Nut cheerios cereal with one glass of 2 percent milk and an orange	Turkey sandwich with mayonnaise, lettuce and tomato. Served with whole wheat chips.	Serving of Pasta with shrimp and two pieces of garlic bread.
Tuesday	Breakfast: Scrambled eggs with American cheese on a whole-wheat English muffin with whole milk	Lunch: A 93 percent lean ground beef burger on a sesame seed bun with tomato, mayo, ketchup and lettuce. Served with a Caesar salad.	Dinner: whole-grain pizza with tomato sauce with mozzarella cheese.
Wednesday	Breakfast: 1 cup of yogurt, half a cup of granola with a chocolate chip granola bar.	Lunch: Whole bread sandwich with steak, onion, and cheese. Served with fries.	Dinner: one portion of baked chicken with garlic and black pepper to add flavor, asparagus and baked rice.
Thursday	Breakfast: 2 Blueberry buttermilk muffins with a glass of orange juice	Lunch: Pasta salad with a glass of whole milk.	Dinner: Four cheese lasagna with an Italian salad. Served with shaved parmigiana.
Friday	Breakfast: Three Buttermilk pancakes with syrup and butter.	Lunch: Oven BBQ chicken wings with carrots and celery. Served with ranch.	Dinner: Sloppy joes with ground beef, stopping by a baking packet and tomato paste on a hamburger bun. Served with water and orange.
Saturday	Breakfast: One white wheat cinnamon roll with icing.	Lunch: Serving of Turkey pepper filled with carrots, peas, potatoes.	Dinner: A T-bone steak served with green beans and mashed potatoes.
Sunday	Breakfast: Two Apple raisin bran muffins	Lunch: Beef Stroganoff with egg noddle's, onions, sour cream, and cheese.	Dinner: Serving of chicken parmigiana with angle hair spaghetti. Served with broccoli.

EXPECTED CONCLUSION

I expect to see that the bacterial composition in MDD is significantly more diverse after six weeks on the Mediterranean diet than the Western diet and Healthy group, indicating that diet and amount of bacteria affect MDD severity and vary as a function of diet. Specifically, an increase in the abundance of Bacteroidetes and Proteobacteria, while a decrease in levels of Lactobacillus and Firmicutes led to lower rates of depression for MDD participants. Future studies should look at a causal relationship between the gut microbiome and the brain.

* It is important to note that this is a hypothetical study and results are based on previous studies.